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IMPACT ON STUDENTS' PERCEPTION ABOUT 'SCIENTISTS AS PERSONS' DUE TO INSTRUCTIONAL PROGRAMME IN SCIENCE

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ABSTRACT

Today's world of science teaching and learning have a lot of bearing about the way we perceive science and the way or method in which scientist works. Understanding, how a scientist works will open doors in opportunities about science teaching and learning. This study attempts to find the Impact on students' perception about 'scientists as persons' due to instructional programme in science. By moving through the phases of engagement, exploration, explaining, elaboration and evaluation the students constantly progressed towards realization about what a scientist do while researching. The change in viewpoint could also be due to the realization of the fact that performing the activities involved teamwork, lot of hard work, coordination among teammates, test of imagination etc.

KEYWORDS: Science Teaching, Learning, Science

INTRODUCTION

National Curriculum Framework (NCF) opens with a quotation from Rabindranath Tagore's essay, Civilization and Progress, in which the poet reminds us that a 'creative spirit' and 'generous joy' are the key aspects in childhood, both of which can be distorted by an unthinking adult world. Learning in children takes place through interactions with the environment, nature, things and people. The physical activity of moving, exploring, doing things on one's own, with one's peers or company of adults are the key processes through which learning occurs. The progress and prosperity of any nation is determined by its standards in science and technology, which is an outcome of the science education provided to its youngsters. The advancement of the developed countries provides ample evidence for this fact. Understanding the prime importance of science education in the advancement of any nation, the developed and developing countries have been attempting to improve their science education by restructuring it to fit with the needs, challenges and expectations of its people.

The vast explosion of scientific knowledge has forced science educators to be highly choosy in respect of what is to be taught and the behavioural outcomes expected. The hundreds of new developments which occur in different scientific disciplines make it difficult or impossible to give them adequate representation in any science curricula. What is today accepted as the latest scientific knowledge soon gets outdated or gets replaced by radically new assumptions and principles. In many countries attempts have been made to reorient the curriculum, so as to give due importance to processes in science education.

Wellington (1990) argued that science education should focus on the 'what', 'how' and 'why' of knowledge.

- Knowledge of 'what' focuses on fads, happenings and phenomena.
- Knowledge of 'how' focuses on skills, processes and abilities.

- Knowledge of 'why' focuses on explanations, models, analogies, theories etc.

Donelly (1985) suggests the conditions for having a practical, theoretical role for science processes in the science curricula and its implementation. They are:

- The processes must be defined at some minimum level of coherence.
- Their connection if any, with pupil's intellectual skills must be ascertained.
- Method for the development of the relevant skills must be explored.

Benz (1962)70 conducted an experimental evaluation of field trips for achieving informational gains in an earth science unit. Four classes of ninth graders (n=109 students) participated in the study. The experimental groups went on excursions to sites of geologic interest, while the control groups remained in the classroom and reviewed the content through slides. Based on comparisons of pre-test and post-test results, Benz concluded that superior students tend to profit more from field trips than do students with average to less-than-average ability, but that field trips may contribute to the understanding of scientific principles for all students.

Images can be powerful in forming beliefs and attitudes, and they can play a role in the construction of identities. Although images are frequently acquired through social transmission, they are also formed from experiences (Howard 1992, White 1988). Chambers (1983) and Haynes (1994)94, among others, provide useful short histories of verbal and visual images of scientists.

OBJECTIVE OF THE STUDY

- To develop instructional programme in science for secondary school students.
- To study the effect of developed Instructional Program in Science on the dimension ‘Scientists as persons’ with respect to students’ idea about science and scientist.

RESEARCH QUESTION

What is the effect of developed Instructional Program in Science on the dimension ‘Scientists as persons’ with respect to students’ idea about science and scientist?

METHODOLOGY AND DESIGN OF THE STUDY

For the present study the researcher has selected the Experimental Method by keeping in mind the objectives of the study and the problem. In order to select a suitable research design for conducting the experiment and assign the subjects to different experimental treatments to measure the outcomes of experiment and assign the subjects to different experimental treatments to measure the outcomes of experiment, the researcher must be well acquainted with different types of experimental designs. Paired t test was used for the present study. In the present study students were asked to rate physicist and biologist on a 5 point scale on various attributes.

SAMPLE OF THE STUDY

Sample for the present study includes 80 students of secondary school (CBSE Board) from class IX. 40 students of secondary school (CBSE Board) from class IX from AECS- 1, Anushaktinagar, Mumbai, Maharashtra were taken as

experimental group and 40 students of secondary school (CBSE Board) from class IX from AECS- 4, Anushaktinagar, Mumbai, Maharashtra were taken as control group.

ANALYSIS AND DISCUSSIONS

This study tries to elicit what children think "real scientists" are like. Two opposite traits are put up on each side of a 5-point scale; the response is given by indicating a position on this scale. The "direction" of the different traits is mixed, so that what may be considered as a positive trait may occur at both ends of the scale. A distinction is made between a person working with physics or engineering (abbr.: a physicist) and a person working with biology or medicine (abbr.: a biologist)

Following attributes were taken into consideration-

- Untidy/tidy
- Unintelligent/Intelligent
- Unimaginative/imaginative
- Selfish/caring
- Lazy/hardworking
- Unsocial/social
- Boring/interesting
- Unkind/kind
- Dominating/democratic

Table 1,2,3,4 and 5,6,7,8 presents the percentage of students from experimental and control groups who ticked each of the five points on the scale as well as the mean (average) values with reference to a physicist and biologist. The means were calculated by considering the negative ends to begin with 1 and the positive end to be 5. In considering the response of students we concentrated on means above and below 2.5 and 3.5 and ignored the means around the average 3.

Table 1: Percentage Responses of Experimental Group Pretest Scores to the Question 'I Think Physicist Is' (N=40)

Traits	1	2	3	4	5	Traits	Mean
Untidy	6	8	10	7	9	Tidy, neat, orderly	3.125
Intelligent	9	8	10	8	5	Not intelligent	2.8
Lacking imagination	5	7	11	9	8	Imaginative, full of ideas	3.2
Caring	11	9	10	6	4	Selfish	2.575
Lazy	6	9	10	7	8	Hardworking	3.05
Unsocial, loner	4	7	10	12	7	Social, outgoing	3.275
Boring person	6	7	10	7	10	Interesting person	3.2
Kind, humane	14	10	10	4	2	Unkind	2.25
Authoritarian	4	8	8	10	10	Democratic	3.35

Table 2: Percentage Responses of Experimental Group Post Test Scores to the Question 'I Think Physicist Is' (N=40)

Traits	1	2	3	4	5	Traits	Mean
Untidy	6	8	9	8	9	Tidy, neat, orderly	3.15
Intelligent	13	11	8	7	1	Not intelligent	2.3
Lacking imagination	5	7	9	10	9	Imaginative, full of ideas	3.275
Caring	10	10	9	8	3	Selfish	2.6
Lazy	7	10	7	7	9	Hardworking	3.025
Unsocial, loner	3	9	9	10	9	Social, outgoing	3.325
Boring person	4	8	10	9	9	Interesting person	3.275
Kind, humane	11	9	10	7	3	Unkind	2.55
Authoritarian	3	7	10	9	11	Democratic	3.45

Table 3: Percentage Responses of Control Group Pretest Scores to the Question 'I Think Physicist Is' (N=40)

Traits	1	2	3	4	5	Traits	Mean
Untidy	3	8	8	10	11	Tidy, neat, orderly	3.45
Intelligent	14	11	9	5	1	Not intelligent	2.2
Lacking imagination	2	3	10	12	13	Imaginative, full of ideas	3.775
Caring	11	10	9	8	2	Selfish	2.5
Lazy	2	3	10	12	13	Hardworking	3.775
Unsocial, loner	2	7	8	11	12	Social, outgoing	3.6
Boring person	4	6	10	9	11	Interesting person	3.425
Kind, humane	10	10	7	8	5	Unkind	2.7
Authoritarian	2	3	10	12	13	Democratic	3.775

Table 4: Percentage Responses of Control Group Post Test Scores to the Question 'I Think Physicist Is' (N=40)

Traits	1	2	3	4	5	Traits	Mean
Untidy	5	8	10	8	9	Tidy, neat, orderly	3.2
Intelligent	13	11	8	7	1	Not intelligent	2.3
Lacking imagination	4	8	9	9	10	Imaginative, full of ideas	3.325
Caring	10	9	8	9	4	Selfish	2.7
Lazy	2	8	10	9	11	Hardworking	3.475
Unsocial, loner	4	7	9	10	10	Social, outgoing	3.375
Boring person	2	5	10	11	12	Interesting person	3.65
Kind, humane	1	4	9	12	14	Unkind	3.85
Authoritarian	3	7	9	10	11	Democratic	3.475

Table 5: Percentage Responses of Experimental Group Pretest Scores to the Question 'I Think Biologist Is' (N=40)

Traits	1	2	3	4	5	Traits	Mean
Untidy	2	7	9	10	12	Tidy, neat, orderly	3.575
Intelligent	11	10	8	8	3	Not intelligent	2.55
Lacking imagination	3	9	8	10	10	Imaginative, full of ideas	3.375
Caring	13	10	10	6	1	Selfish	2.3
Lazy	3	6	9	10	12	Hardworking	3.55
Unsocial, loner	2	8	10	9	11	Social, outgoing	3.475
Boring person	1	9	8	10	12	Interesting person	3.575
Kind, humane	11	10	9	8	2	Unkind	2.5
Authoritarian	1	5	9	12	13	Democratic	3.775

Table 6: Percentage Responses of Experimental Group Posttest Scores to the Question 'I Think Biologist Is'(N=40)

Traits	1	2	3	4	5	Traits	Mean
Untidy	1	4	10	11	14	Tidy, neat, orderly	3.825
Intelligent	11	10	11	7	1	Not intelligent	2.425
Lacking imagination	2	6	10	10	12	Imaginative, full of ideas	3.6
Caring	13	12	9	5	1	Selfish	2.225
Lazy	2	6	8	11	13	Hardworking	3.675
Unsocial, loner	2	8	9	10	11	Social, outgoing	3.5
Boring person	1	6	9	11	13	Interesting person	3.725
Kind, humane	11	10	10	7	2	Unkind	2.475
Authoritarian	1	6	9	10	14	Democratic	3.75

Table 7: Percentage Responses of Control Group Pretest Scores to the Question 'I Think Biologist Is'

Traits	1	2	3	4	5	Traits	Mean
Untidy	2	6	9	11	12	Tidy, neat, orderly	3.625
Intelligent	11	10	9	8	2	Not intelligent	2.5
Lacking imagination	3	7	9	10	11	Imaginative, full of ideas	3.475
Caring	13	11	10	5	1	Selfish	2.25
Lazy	2	8	7	10	13	Hardworking	3.6
Unsocial, loner	3	5	8	11	13	Social, outgoing	3.65
Boring person	1	7	9	10	13	Interesting person	3.675
Kind, humane	13	12	10	4	1	Unkind	2.2
Authoritarian	1	5	10	11	13	Democratic	3.75

Table 8: Percentage Responses of Control Group Posttest Scores to the Question 'I Think Biologist Is'

Traits	1	2	3	4	5	Traits	Mean
Untidy	2	6	10	10	12	Tidy, neat, orderly	3.6
Intelligent	11	12	11	4	2	Not intelligent	2.35
Lacking imagination	4	6	8	10	12	Imaginative, full of ideas	3.5
Caring	13	11	9	5	2	Selfish	2.3
Lazy	2	5	10	11	12	Hardworking	3.65
Unsocial, loner	4	6	9	10	11	Social, outgoing	3.45
Boring person	2	6	7	12	13	Interesting person	3.7
Kind, humane	14	10	10	5	1	Unkind	2.225
Authoritarian	2	6	9	9	14	Democratic	3.675

The total sample of experimental group students provided an overall positive impression of scientist (physicist and biologist). A comparison of students' views during pre-intervention and post intervention was conducted by comparing the means (average) of students using paired t -test (Garret 1966). The post intervention evaluation of the experimental group indicated that Physicists were positively placed for the following traits: - tidy (t value 3.11, 2 tailed probability 0.002), imaginative (t value 3.04 2 tailed probability 0.002), interesting (t value 6.14 2 tailed probability 0.000), kind (t value 3.98 2 tailed probability 0.000) and democratic (t value 3.51 2 tailed probability 0.000). With respect to the opposite traits: selfishness/ caring, hardworking/lazy, and social/ loner, physicists were placed by the students near the average yet on the positive side, that is hardworking, caring and social. The traits selected by students which indicate the positive view of biologists were: - tidy (t value 2.976,2 tailed probability 0.002), intelligent (t value 3.054, 2 tailed probability 0.000), imaginative (t value 3.179, 2 tailed probability 0.000), caring (t value 4.0887, 2 tailed probability 0.000) and kind (t value 3.6, 2 tailed probability 0.000). With respect to traits such as democracy, interesting, social and

hardworking, biologists were rated near the average though on the positive side. A look at the performance of the control group students pretest and posttest scores to the question 'I think physicist is' and 'I think biologist is', a move towards positive side though insignificant was observed for almost all of the traits.

CONCLUSIONS AND REVIEW

Images can be powerful in forming beliefs and attitudes, and they can play a role in the construction of identities. Although images are frequently acquired through social transmission, they are also formed from experiences (Howard 1992, White 1988).While carrying out the activities the experimental group students had to move through all the stages through which a scientist normally passes. By moving through the phases of engagement, exploration, explaining, elaboration and evaluation the students constantly progressed towards realization about what a scientist do while researching. The change in viewpoint could also be due to the realization of the fact that performing the activities involved teamwork, lot of hard work, coordination among teammates, test of imagination etc.

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